

1 **CLAIMS**

2 1. A system comprising:

3 a stage assembly comprising a plurality of stages configured to receive data
4 that is to be processed by a rasterization pipeline;

5 an arbitrary ordering component operably associated with the stage
6 assembly;

7 a rasterization pipeline comprising a plurality of components configured to
8 process data from the stage assembly; and

9 the arbitrary ordering component being configured to enable an arbitrary
10 order of components of the rasterization pipeline to be specified for processing
11 data from the stage assembly.

12
13 2. The system of claim 1, wherein the data comprises pixel data.

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15 3. The system of claim 1, wherein the rasterization pipeline comprises at
16 least one alpha blending component, and the arbitrary ordering component is
17 configured to enable the alpha blending component to process the data before
18 another component of the rasterization pipeline.

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20 4. The system of claim 1, wherein at least some of the stages have an
21 output line that can route data to a next stage and to the arbitrary ordering
22 component.

1 5. The system of claim 1, wherein at least some of the stages have an
2 input line that can receive data from a previous stage, or from the arbitrary
3 ordering component.

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5 6. The system of claim 1, wherein at least some of the stages have (a) an
6 output line that can route data to a next stage and to the arbitrary ordering
7 component, and (b) an input line that can receive data from a previous stage, or
8 from the arbitrary ordering component.

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10 7. A computing system comprising:
11 one or more processors;
12 one or more computer-readable media for holding computer-readable
13 instructions that are executable on the one or more processors;
14 a graphics subsystem operably coupled with the one or more processors and
15 comprising:
16 a stage assembly comprising a plurality of stages configured to
17 receive data that is to be processed by a rasterization pipeline;
18 an arbitrary ordering component operably associated with the stage
19 assembly;
20 a rasterization pipeline comprising a plurality of components
21 configured to process data from the stage assembly; and
22 the arbitrary ordering component being configured to enable an
23 arbitrary order of components of the rasterization pipeline to be specified
24 for processing data from the stage assembly.

1 8. The system of claim 7, wherein the data comprises pixel data.

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3 9. The system of claim 7, wherein the rasterization pipeline comprises at
4 least one alpha blending component, and the arbitrary ordering component is
5 configured to enable the alpha blending component to process the data before
6 another component of the rasterization pipeline.

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8 10. The system of claim 7, wherein at least some of the stages have an
9 output line that can route data to a next stage and to the arbitrary ordering
10 component.

11
12 11. The system of claim 7, wherein at least some of the stages have an
13 input line that can receive data from a previous stage, or from the arbitrary
14 ordering component.

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16 12. The system of claim 7, wherein at least some of the stages have (a)
17 an output line that can route data to a next stage and to the arbitrary ordering
18 component, and (b) an input line that can receive data from a previous stage, or
19 from the arbitrary ordering component.

20
21 13. The system of claim 7, wherein the rasterization pipeline comprises
22 components selected from a group of components comprising: at least one fog
23 component, at least one alpha blending component, and at least one texture
24 component.

1 **14.** The system of claim 7, wherein the rasterization pipeline comprises
2 components selected from a group of components comprising: at least one fog
3 component, at least one alpha blending component, at least one specular
4 component and at least one texture component.

5
6 **15.** A system comprising:

7 a stage assembly comprising a plurality of stages configured to receive data
8 that is to be processed by a rasterization pipeline;

9 an arbitrary ordering component operably associated with the stage
10 assembly;

11 a rasterization pipeline comprising a plurality of components configured to
12 process data from the stage assembly, said plurality of components comprising at
13 least one fog component, at least one alpha blending component, and at least one
14 texture component; and

15 the arbitrary ordering component being configured to enable an arbitrary
16 order of components of the rasterization pipeline to be specified for processing
17 data from the stage assembly such that the alpha blending component need not be
18 the last component of the rasterization pipeline to process the data.

19
20 **16.** The system of claim 15, wherein the arbitrary ordering component is
21 programmable.

1 **17.** The system of claim 15, wherein the arbitrary ordering component
2 comprises an assembly of multiplexers interposed between the stage assembly and
3 the rasterization pipeline.

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5 **18.** The system of claim 15, wherein the data comprises pixel data.

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7 **19.** The system of claim 15, wherein at least some of the stages have an
8 output line that can route data to a next stage and to the arbitrary ordering
9 component.

10

11 **20.** The system of claim 15, wherein at least some of the stages have an
12 input line that can receive data from a previous stage, or from the arbitrary
13 ordering component.

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15 **21.** The system of claim 15, wherein at least some of the stages have (a)
16 an output line that can route data to a next stage and to the arbitrary ordering
17 component, and (b) an input line that can receive data from a previous stage, or
18 from the arbitrary ordering component.

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20 **22.** A computer system embodying the system of claim 15.

1 23. A three-dimensional, computer graphics system comprising a
2 rasterization pipeline having multiple components, and means for routing pixel
3 data to individual components of the rasterization pipeline in no particular fixed
4 order.

5
6 24. The system of claim 23, wherein the multiple components comprise
7 at least a fog component.

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9 25. The system of claim 23, wherein the multiple components comprise
10 at least an alpha blending component.

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12 26. The system of claim 23, wherein the multiple components comprise
13 at least a texture component.

14
15 27. The system of claim 23, wherein the multiple components comprise
16 at least a fog component and at least a texture component.

17
18 28. The system of claim 23, wherein the multiple components comprise
19 at least a fog component and at least an alpha blending component.

20
21 29. The system of claim 23, wherein the multiple components comprise
22 at least a specular component.

1 **30.** The system of claim 23, wherein the multiple components comprise
2 at least a specular component and an alpha blending component.

3

4 **31.** A three-dimensional, computer graphics system comprising a
5 rasterization pipeline having multiple components, and multiple multiplexers for
6 arbitrarily routing pixel data to individual components of the rasterization pipeline.

7

8 **32.** A system comprising:
9 a stage assembly comprising a plurality of stages configured to receive data
10 that is to be processed by a rasterization pipeline;
11 an arbitrary ordering component operably associated with the stage
12 assembly, the arbitrary ordering component comprising a first group of
13 multiplexers and a second group of multiplexers;
14 a rasterization pipeline comprising a plurality of components configured to
15 process data from the stage assembly;
16 the first group of multiplexers having individual inputs received from the
17 stage assembly and individual outputs provided to the rasterization pipeline; and
18 the second group of multiplexers having individual inputs received from the
19 rasterization pipeline and individual outputs provided to the stage assembly.

20

21 **33.** The system of claim 32, wherein each individual component of the
22 rasterization pipeline has an associated first group multiplexer from which it
23 receives an input.

1 34. The system of claim 32, wherein each individual input of a
2 multiplexer of the second group is associated with a different component of the
3 rasterization pipeline.

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5 35. The system of claim 32, wherein each individual component of the
6 rasterization pipeline has an associated first group multiplexer from which it
7 receives an input, and each individual input of a multiplexer of the second group is
8 associated with a different component of the rasterization pipeline.

9

10 36. The system of claim 32, wherein the data comprises pixel data.

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12 37. The system of claim 32, wherein the rasterization pipeline comprises
13 at least one alpha blending component, and the arbitrary ordering component is
14 configured to enable the alpha blending component to process the data before at
15 least one other component of the rasterization pipeline.

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17 38. The system of claim 32, wherein at least some of the stages have an
18 output line that can route data to a next stage and to the multiplexers of the first
19 group of multiplexers.

20

21 39. The system of claim 32, wherein at least some of the stages have an
22 input line that can receive data from a previous stage, or from a multiplexer of the
23 second group of multiplexers.

1 **40.** A computer system comprising:
2 one or more processors;
3 one or more computer-readable media for holding computer-readable
4 instructions that are executable on the one or more processors;
5 a graphics subsystem operably coupled with the one or more processors and
6 comprising:

7 a stage assembly comprising a plurality of stages configured to
8 receive data that is to be processed by a rasterization pipeline;

9 an arbitrary ordering component operably associated with the stage
10 assembly, the arbitrary ordering component comprising a first group of
11 multiplexers and a second group of multiplexers;

12 a rasterization pipeline comprising a plurality of components
13 configured to process data from the stage assembly;

14 the first group of multiplexers having individual inputs received
15 from the stage assembly and individual outputs provided to the rasterization
16 pipeline; and

17 the second group of multiplexers having individual inputs received
18 from the rasterization pipeline and individual outputs provided to the stage
19 assembly.

20
21 **41.** The computer system of claim 40, wherein each individual
22 component of the rasterization pipeline has an associated first group multiplexer
23 from which it receives an input.

1 **42.** The computer system of claim 40, wherein each individual input of
2 a multiplexer of the second group is associated with a different component of the
3 rasterization pipeline.

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5 **43.** The computer system of claim 40, wherein each individual
6 component of the rasterization pipeline has an associated first group multiplexer
7 from which it receives an input, and each individual input of a multiplexer of the
8 second group is associated with a different component of the rasterization pipeline.

9

10 **44.** The computer system of claim 40, wherein the data comprises pixel
11 data.

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13 **45.** The computer system of claim 40, wherein the rasterization pipeline
14 comprises at least one alpha blending component, and the arbitrary ordering
15 component is configured to enable the alpha blending component to process the
16 data before at least one other component of the rasterization pipeline.

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18 **46.** The computer system of claim 40, wherein at least some of the
19 stages have an output line that can route data to a next stage and to the
20 multiplexers of the first group of multiplexers.

21

22 **47.** The computer system of claim 40, wherein at least some of the
23 stages have an input line that can receive data from a previous stage, or from a
24 multiplexer of the second group of multiplexers.

1 **48.** A method comprising:

2 receiving pixel data that is to be processed by a rasterization pipeline

3 having a plurality of components; and

4 routing the pixel data, using an arbitrary ordering component, to one of a
5 plurality of rasterization pipeline components, wherein said routing can comprise
6 routing the pixel data to an alpha blending component prior to routing the pixel
7 data to another component of the rasterization pipeline.

8

9 **49.** The method of claim 48 further comprising routing resultant data,
10 using the arbitrary ordering component, back to a stage assembly comprising a
11 plurality of stages that are configured to receive pixel data.

12

13 **50.** The method of claim 48 further comprising routing resultant data,
14 using the arbitrary ordering component, back to a stage assembly comprising a
15 plurality of stages that are configured to receive pixel data, and wherein said
16 routing of the resultant pixel data comprises selecting at least one multiplexer
17 sufficient to route the pixel data to the stage assembly.

18

19 **51.** The method of claim 48, wherein the rasterization pipeline
20 comprises components selected from a group of components comprising a texture
21 component and a fog component.

1 **52.** The method of claim 48, wherein said routing comprises selecting at
2 least one multiplexer sufficient to route the pixel data to a rasterization pipeline
3 component.

4
5 **53.** A method comprising:

6 receiving, in a stage assembly, pixel data that is to be processed by a
7 rasterization pipeline having a plurality of components comprising at least a
8 texture component, a fog component and an alpha blending component;

9 selecting a first multiplexer, whose inputs are received from different stages
10 of the stage assembly, sufficient to route the pixel data to one of the components
11 of the rasterization pipeline;

12 processing the pixel data with the component to provide resultant pixel
13 data; and

14 selecting a second multiplexer, whose inputs are received from different
15 components of the rasterization pipeline, sufficient to route the resultant pixel data
16 to the stage assembly.

17
18 **54.** The method of claim 53, wherein said act of selecting the first
19 multiplexer can be performed such that the alpha blending component is not the
20 last component in the rasterization pipeline to process the pixel data.

1 **55.** The method of claim 53, wherein the first multiplexer comprises one
2 multiplexer of a first group of multiplexers, and the second multiplexer comprises
3 one multiplexer of a second group of multiplexers, each individual multiplexer of
4 the first group having an output that is associated with a respective one of the
5 components of the rasterization pipeline, each individual multiplexer of the second
6 group having an output that is associated with a different respective stage of the
7 stage assembly.

8
9 **56.** A method comprising:

10 associating a stage assembly with an arbitrary ordering component, the
11 stage assembly comprising a plurality of stages configured to receive data that is
12 to be processed by a rasterization pipeline, the arbitrary ordering component being
13 configured to enable an arbitrary order of components of the rasterization pipeline
14 to be specified for processing data from the stage assembly; and

15 associating a rasterization pipeline with the arbitrary ordering component,
16 the rasterization pipeline comprising a plurality of components configured to
17 process data from the stage assembly.

18
19 **57.** The method of claim 56, wherein the act of associating the stage
20 assembly comprises associating the stage assembly with a rasterization pipeline
21 comprising at least one alpha blending component, the arbitrary ordering
22 component being configured to enable the alpha blending component to process
23 the data before another component of the rasterization pipeline.

1 **58.** The method of claim 56, wherein the act of associating the stage
2 assembly comprises associating the stage assembly with a rasterization pipeline
3 comprising at least one fog component, at least one alpha blending component,
4 and at least one texture component, the arbitrary ordering component being
5 configured to enable the alpha blending component to process the data before
6 another component of the rasterization pipeline.

7
8 **59.** The method of claim 56, wherein the act of associating the stage
9 assembly comprises associating the stage assembly with a rasterization pipeline
10 comprising at least one fog component, at least one alpha blending component, at
11 least one texture component, and at least one specular component, the arbitrary
12 ordering component being configured to enable the alpha blending component to
13 process the data before another component of the rasterization pipeline.

14
15 **60.** The method of claim 56, wherein the acts of associating are
16 performed by operably connecting a plurality of multiplexers between the stage
17 assembly and rasterization pipeline, wherein at least some of the multiplexers
18 route pixel data from the stage assembly to the rasterization pipeline, and at least
19 other of the multiplexers route resultant pixel data from the rasterization pipeline
20 to the stage assembly.